



SAMPLE MATERIAL

Unwrapping Mathematics Standards

Twin Groves Middle School, Illinois

Topic: National Math Panel: Critical Foundations for Algebra

Practice: Mathematics Preparation for Algebra

District staff have developed a systematized process for creating a common understanding of mathematics standards among administrative and teaching staff. They describe the process as “unwrapping” the standards. Staff analyze standards to better understand what they require from students both cognitively and in terms of content. The resource presented here lists different types of cognitive demands and categories of knowledge used by the district to analyze or “unwrap” their standards. Other school leaders might find this district’s approach helpful in developing their own procedures for supporting teachers in developing common meaning around mathematics standards.

An Approach for Unwrapping Mathematics Standards

Adapted from materials developed by School District 96 Kildeer, IL

Most educators are familiar with Bloom's Taxonomy of Educational Objectives (Bloom et al., 1956). In recent years, as educators have become increasingly focused on the accurate assessment of student learning, the original taxonomy has been revisited and revised (Anderson et al., 2001). Unlike the original, the revised framework is two-dimensional. In the newer model, the two dimensions are cognitive process and knowledge. These two components can be used to analyze standards to identify the cognitive process and type of knowledge required by the student.

The cognitive process addressed by a standard can be determined from the verb that represents student learning; while the type of knowledge can be determined from the noun that represents what the student is to learn. The six cognitive processes in the revised taxonomy are *remember, understand, apply, analyze, evaluate, and create*. These are just slightly different from the original six levels of Bloom's Taxonomy. The four categories of knowledge in the revised taxonomy are *factual, conceptual, procedural, and metacognitive*. The revised taxonomy works well with the "unwrapping" process and later, in designing effective formative assessment items.

Cognitive processes (the verb in a standard):

1. Remember – to retrieve relevant knowledge from long-term memory (Anderson et al., 2001, p. 67)
 - Verbs associated with this level: tell, list, define, label, recite, recall, retrieve, name, record, relate, recognize, identify, describe, examine, group, locate, match, say, show, tell, write.
2. Understand – to construct meaning from instructional messages, including oral, written, and graphic communication (Anderson et al., 2001, p. 67)
 - Verbs associated with this level: interpret, clarify, paraphrase, represent, translate, exemplify, illustrate, classify, categorize, summarize, generalize, infer, conclude, predict, compare, contrast, match, explain, construct, differentiate, distinguish, reorganize.
3. Apply – to carry out or use a procedure in a given situation (Anderson et al., 2001, p. 67)
 - Verbs associated with this level: apply, execute, carry out, implement, use, construct, model, display, illustrate.
4. Analyze – to break material into its constituent parts and determine how the parts related to one another and to an overall structure or purpose (Anderson et al., 2001, p. 68)
 - Verbs associated with this level: differentiate, determine, discriminate, distinguish, focus, select, organize, integrate, outline, structure, deconstruct, solve (a problem), experiment, investigate, reduce, attribute, connect, ascertain.
5. Evaluate – to make judgments based on criteria and standards (Anderson et al., 2001, p. 68)
 - Verbs associated with this level: check, coordinate, detect, monitor, test, judge, critique, appraise, criticize, defend, justify, assess, prioritize, award, convince, discriminate, order, rank, recommend, support.
6. Create – to put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure; inventing a product (Anderson et al., 2001, p. 68)
 - Verbs associated with this level: make, generate, hypothesize, plan, design, produce, construct, compose, formulate, invent, develop, refine, produce, transform, originate, test, execute.

References:

- Anderson, L.W., et al. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman.
- Bloom, B.S., et al. (1956). *The Taxonomy of Educational Objectives: Handbook I, Cognitive Domain*. New York: David McKay.